

I claim:

1. Tissue removal apparatus comprising:  
a flexible drill shaft;  
a cutting tip mounted on said shaft for cutting tissue;  
means for transmitting motion to said shaft to move said cutting tip against the tissue to cut tissue fragments from the tissue; and  
means for removing the tissue fragments along said shaft by suction to a location outside the body while cutting.
2. An apparatus as defined in claim 1 including means for collecting one or more selected components of the removed tissue fragments for implantation of the fragments into the body of the patient from whom they were removed.
3. An apparatus as defined in claim 1 wherein said drill shaft comprises a polymeric or composite material.
4. An apparatus as defined in claim 1 wherein said cutting tip comprises a polymeric or composite material with hardness specific to tissue application.

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5. An apparatus as defined in claim 2 wherein said cutting tip is made of a composite or ceramic material.

6. An apparatus as defined in claim 1 wherein said flexible drill includes surface means defining a suction passage extending axially along said drill shaft through which said bone fragments are removed, said suction passage having a smooth polymeric surface to reduce friction.

7. An apparatus as defined in claim 1 further including guide means for controlling the location of said cutting tip within the tissue.

8. An apparatus as defined in claim 7 wherein said guide means comprises a guide rod extending within said flexible cutting shaft to allow said shaft to advance into a space.

9. An apparatus as defined in claim 8 wherein said guide means is selectively rigidifiable.

10. An apparatus as defined in claim 1 including means for injecting fluid to a location adjacent said cutting tip including surface means defining a fluid injection passage extending axially along said flexible shaft.

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11. An apparatus as defined in claim 1 wherein said flexible drill shaft is hollow and comprising a non-moving flexible sleeve extending generally coaxially about said flexible drill shaft.

12. An apparatus as defined in claim 11 including an axially extending suction passage between said flexible drill shaft and said flexible sleeve and through which the tissue fragments are removed.

13. An apparatus as defined in claim 1 wherein said flexible drill shaft is solid and comprising a flexible sleeve extending generally coaxially about said flexible drill shaft and movable with said flexible drill shaft when said flexible drill shaft is moved to cut tissue.

14. An apparatus as defined in claim 1 comprising a formable sleeve extending generally coaxially with said flexible drill shaft.

15. An apparatus as defined in claim 1 comprising a disposable liner sleeve at least partially defining a suction passage for the harvested tissue fragments.

16. Tissue removal apparatus comprising:  
a flexible shaft;

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a cutting tip mounted on said shaft for placement within a tissue mass;

means for transmitting rotary or oscillatory motion to said shaft to move said cutting tip against the tissue to cut tissue fragments from the tissue mass;

means for removing the tissue fragments along said shaft by suction to a location outside the body while cutting; and

means for collecting one or more selected components of the removed tissue fragments for implantation of the fragments into the body of the patient from whom they were removed.

17. An apparatus as defined in claim 16 wherein said means for collecting comprises a trap or a filter or a strainer.

18. An apparatus as defined in claim 16 wherein said flexible shaft includes surface means defining an axially extending suction passage along said flexible shaft through which said tissue fragments are removed, said suction passage having a smooth polymeric surface to reduce friction of the removed tissue fragments.

19. Tissue removal apparatus comprising:  
a flexible hollow drill shaft;  
a cutting tip mounted on said shaft;

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.. means for transmitting rotary or oscillatory motion to said drill shaft to move said cutting tip within a tissue mass to cut tissue fragments from the tissue mass;

means for removing the tissue fragments along said shaft by suction to a location outside the body while cutting; and

guide means for controlling the location of said cutting tip within the tissue mass.

20. An apparatus as defined in claim 19 wherein said guide means comprises a guide rod extending within said flexible drill shaft.

21. An apparatus as defined in claim 19 wherein said guide means comprises a hollow guide sleeve outside said flexible drill shaft.

22. An apparatus as defined in claim 19 wherein said guide means is selectively rigidifiable.

23. An apparatus as defined in claim 19 comprising a second flexible shaft extending generally coaxially with said flexible drill shaft and movable with said flexible drill shaft when said flexible drill shaft is moved to cut tissue.

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24. An apparatus as defined in claim 19 comprising a formable sleeve extending generally coaxially about said flexible drill shaft.

25. Tissue removal apparatus comprising:  
a flexible shaft for insertion inside a tissue mass;  
a cutting tip mounted on said shaft for cutting the tissue;  
means for transmitting motion to said shaft to move said cutting tip against the tissue to cut tissue fragments from the tissue mass;  
guide means for controlling the location of said cutting tip within the tissue mass;  
means for removing the tissue fragments along said shaft by suction to a location outside the body while cutting; and  
means for collecting one or more selected components of the harvested tissue fragments for implantation of the fragments into the body of the patient from whom they were removed.

26. A method comprising the steps of:  
placing within a tissue mass a flexible shaft having mounted thereon a cutting tip for cutting the tissue mass;

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transmitting motion to said shaft to move said cutting tip against the tissue to cut tissue fragments from the tissue mass; and

removing the tissue fragments along the shaft by suction to a location outside the tissue mass while cutting the tissue.

27. A method as defined in claim 26 further including the step of controlling the location of said cutting tip within the tissue mass with a guide rod.

28. A method as defined in claim 26 including the step of cutting bone with a cutting tip which is harder than cancellous bone.

29. A method as defined in claim 26 further including the step of collecting one or more selected components of the removed tissue fragments for implantation into the body of the patient from whom they were removed.

30. A method as defined in claim 29 further including the step of controlling the location of said cutting tip within the tissue mass with a guide rod.

31. A method of grafting human tissue comprising the steps of obtaining a quantity of tissue fragments suitable

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for grafting, compressing the tissue fragments into a plug suitable for implantation, and securing the compressed tissue fragments in the graft location with a retainer.

32. A method as defined in claim 31 wherein the retainer is a biodegradable mesh or sac.

33. A method as defined in claim 31 wherein the retainer is a mass of solidified flowable polymeric material.

34. A method as defined in claim 33 wherein the polymeric material is a biodegradable material.

35. Tissue removal apparatus comprising a rotatable flexible drill shaft and a rotary cutting tip attached to said shaft for placement adjacent or within a tissue mass for cutting the tissue, said rotary cutting tip having first and second adjacent cutting edges spaced apart in the direction of rotation including a leading edge for grabbing the tissue to be cut and a trailing edge for cutting the tissue.

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